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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/738,165	12/15/2000	Tamiya Onodera	JA919990276	2290

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EXAMINER
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ALI, SYED J

ART UNIT	PAPER NUMBER
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2127

DATE MAILED: 06/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

File

<b>Office Action Summary</b>	<b>Application No.</b>		<b>Applicant(s)</b>	
	09/738,165		ONODERA, TAMIYA	
	<b>Examiner</b>		<b>Art Unit</b>	
	Syed J Ali		2127	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 December 2000.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input checked="" type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>3</u> .   | 6) <input type="checkbox"/> Other: _____                                    |

**DETAILED ACTION**

1. Claims 1-18 are pending in this application.

***Claim Rejections - 35 USC § 101***

2. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. **Claims 5-8 and 14-18 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.**

4. As per claims 5, 14, and 16, the apparatus is at best a software system, per se, failing to be tangibly embodied or include any recited hardware as part of the apparatus.

5. As per claims 6-8, 15, and 17-18, they are dependent from non-statutory claims 5, 14, and 16, respectively, and are thus non-statutory for at least the same reasons as discussed for their parent claims, as they also fail to recite any limitations that resolve the deficiencies noted above in the claims from which they depend.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. **Claims 1-3 and 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over IBM Technical Disclosure Bulletin ("Weak Locks with Two-Level Locking Multi-Computer System Protocol to Reduce Lock-Holding Time") (hereinafter IBM).**

8. As per claim 1, IBM teaches the invention as claimed, including in a shared memory model system, a method whereby, in a state wherein a plurality of transactions exist, a bit that represents a lock type and an identifier for a transaction that has acquired a lock in accordance with a first lock type, or an identifier of a second lock type, are stored in a storage area that corresponds to an object and a lock on an object is thus managed, said method comprising:

determining if a second transaction attempts to acquire a lock on a specific object that is held by a first transaction, whether a bit that represents said lock type on said specific object represents said first lock type (pg. 288, paragraph 8);

setting a contention bit if said bit represents said first lock type (pg. 288, paragraph 8);

determining, before said first transaction unlocks said specific object, whether said bit that represents said lock type represents said first lock type (pg. 288, paragraph 7);

storing in said storage area a special identifier that differs from the identifiers for said plurality of transactions (pg. 287, paragraphs 7-8);

issuing a synchronization command for said memory system (pgs. 287-288, paragraph 6);

storing in said storage area data indicating the absence of a transaction that holds said lock on said specific object (pgs. 287-288, paragraph 6);

determining whether said contention bit has been set if said bit that represents said lock type represents said first lock type (pgs. 288-289, paragraphs 8 and 11); and

terminating an unlocking process if said contention bit has not been set without any other process being performed (pgs. 288-289, paragraphs 7-8 and 11).

9. “Official Notice” is taken that although the locking related in IBM is for “transactions” as opposed to the claimed “threads”, this discrepancy is incidental. IBM provides concurrency control for “transactions” that are in contention to hold a lock, such as on an input/output device. It would have been obvious to one of ordinary skill in the art to apply the same locking mechanism to threads accessing different types of shared resources since similar concurrency controls are commonly provided for threads, as they execute on processors in an interleaved or time-sliced fashion. Concurrency must be provided such that the shared resources are left in a consistent state. Since multiple threads may be running on the same processor in a computer system, it is important to reduce the amount of time that a single thread occupies a resource. Thus, a multithreaded system would benefit from the multi-level locking system of IBM that seeks to reduce the amount of time a lock is held by a single “transaction”. Hereinafter, IBM’s use of the term “transaction(s)” is considered functionally equivalent to the claimed “thread(s)”.

10. As per claim 2, IBM teaches the invention as claimed, including the lock management method according to claim 1, further comprising:

shifting said first thread, when said contention bit has been set, to an exclusive control state for a mechanism that enables the exclusive control of the accessing of said object, and a thread waiting operation and the transmission to a waiting thread of a notification, both of which are to be performed when a predetermined condition has been established (pg. 289, paragraph 10);

permitting said first thread to transmit said notification to said waiting thread (pgs. 288, paragraph 8);

setting said second thread in the busy waiting state, when said predetermined condition has not been established and when said special identifier has been stored, until a thread that holds said lock on said specific object is no longer present and until said bit that represents said lock type represents said first lock type (pgs. 287-288, paragraphs 6-8); and

permitting said first thread to exit said exclusive control state (pg. 288, paragraphs 7-8).

11. As per claim 3, IBM teaches the invention as claimed, including the lock management method according to claim 1, wherein said first lock type is a lock method whereby to manage a lock state an identifier for a thread that has locked an object is stored in correlation with said object (pgs. 287-288, paragraphs 6-7).

12. As per claims 5-7, IBM teaches the invention as claimed, including an apparatus comprising means for implementing the method of claims 1-3, respectively (pg. 287, paragraph 1).

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13. **Claims 4 and 8-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over IBM in view of Clark (USPN 6,598,068).**

14. As per claim 4, Clark teaches the invention as claimed, including the following limitations not shown by IBM:

the lock management method according to claim 1, wherein said second lock type is a lock method whereby a queue is employed to manage a thread that has locked an access to an object (col. 10 lines 5-42).

15. It would have been obvious to one of ordinary skill in the art to combine IBM and Clark since under certain circumstances, contention for a shared resource may be undesirable, as it may lead to starvation or deadlock conditions. That is, a particular thread may be prevented from gaining access to a shared resource, causing starvation, wherein another thread may need a result that thread is to process, causing deadlock. In such a situation, a fairly weighted queue dispatching mechanism would guarantee each thread at least a portion of the resource in the order in which it issues its request. Thus, the combination of IBM and Clark provides the advantages gained by IBM of minimizing the amount of time a thread spends on a shared resource, while also preventing common concurrency problems such as starvation and deadlock.

16. As per claim 8, IBM teaches the invention as claimed, including an apparatus comprising means for implementing the method of claim 4 (pg. 287, paragraph 1).

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17. As per claim 9, IBM teaches the invention as claimed, including in a shared memory model system, a method whereby, in a state wherein a plurality of threads exist, a bit that represents a lock is stored in a storage area that corresponds to an object to manage a lock on an object, said method comprising:

determining, when a second thread attempts to acquire a lock on a specific object that a first thread has locked, whether a bit that is used to represent said lock on said object represents the locked state (pgs. 287-288, paragraphs 6 and 8);

shifting said second thread to a control state, for a mechanism that performs a waiting operation for accessing said specific object and a recovery operation by transmitting a notification (pgs. 287-289, paragraphs 6-8 and 10);

storing said bit that represents said locked state in said storage area before said first thread unlocks said object (pgs. 288-289, paragraphs 7-8 and 11);

determining whether a waiting thread is present (pg. 288, paragraph 8);

shifting said first thread to a notification state, wherein said transmission of a notification to said thread that is waiting is initiated (pgs. 287-288, paragraphs 6 and 8); and

permitting said first thread to exit said notification state (pgs. 288-289, paragraphs 7-8 and 11).

18. Clark teaches the invention as claimed, including the following limitations not shown by IBM:

a queue of threads that accesses said object is stored (col. 10 lines 5-42);

changing data for the number of queues of threads that access said specific object and storing the updated data when said bit represents said locked state (col. 9 line 37 - col. 10 line 4);



storing said second thread in a queue for a mechanism that performs a waiting operation for accessing said specific object and a recovery operation by transmitting a notification (col. 10 lines 5-42);

determining whether a thread that is stored in a queue is present (col. 9 line 59 - col. 10 line 4); and

wherein said transmission of a notification to said thread that is waiting is initiated, when a thread that is stored in a queue is present (col. 10 lines 5-14).

19. As per claim 10, Clark teaches the invention as claimed, including the lock management method according to claim 9, further comprising:

increasing, when said bit that represents said locked state is set, the number of queues of threads that can access said specific object and storing the updated number, and determining whether said bit that represents said lock on said specific object represents said locked state (col. 9 lines 37-46); and

reducing, when said bit that represents said locked state is not set, the number of said queues of said threads that access said specific object and storing the updated number, and terminating a locking process without any other process being performed (col. 10 lines 5-14).

20. As per claim 11, IBM teaches the invention as claimed, including in a shared memory model system, a method whereby, in a state wherein a plurality of threads exist, a bit that represents a lock is stored in a storage area that corresponds to an object to manage a lock on an object, said method comprising:

determining, when a second thread attempts to acquire a lock on a specific object that a first thread has locked, whether a bit that represents said lock on said object represents the locked state (pgs. 287-288, paragraphs 6 and 8);

shifting said second thread to a control state for a mechanism that performs a waiting operation, for accessing said specific object, and a recovery operation by transmitting a notification (pgs. 287-289, paragraphs 6-8 and 10);

storing in said storage area, before said first thread unlocks said object, said bit that represents said locked state and an identifier that is not related to the representation of said locked state or unlocked state (pgs. 288-289, paragraphs 7-8 and 11);

issuing a synchronization command for said storage area (pgs. 287-288, paragraph 6);

storing, in said storage area, data that does not represent said lock on said specific object (pg. 288, paragraph 8);

determining whether a waiting thread is present (pg. 288, paragraph 8);

shifting said first thread to a notification state wherein said transmission is initiated for issuing a notification to said thread that is waiting (pgs. 287-288, paragraphs 6 and 8); and

permitting said first thread to exit said notification state (pgs. 288-289, paragraphs 7-8 and 11).

21. Clark teaches the invention as claimed, including the following limitations not shown by IBM:

a queue of threads that accesses said object is stored (col. 10 lines 5-42);

changing, when said bit represents said locked state, data for the number of queues of threads that can access said specific object and storing the updated data, and thereafter issuing a synchronization command for said storage area (col. 9 line 37 - col. 10 line 42);

storing said second thread in a queue for a mechanism that performs a waiting operation for accessing said specific object and a recovery operation by transmitting a notification (col. 10 lines 5-42);

determining whether a thread that is stored in a queue is present (col. 9 line 59 - col. 10 line 4); and

wherein said transmission of a notification to said thread that is waiting is initiated, when a thread that is stored in a queue is present (col. 10 lines 5-14).

22. As per claim 12, Clark teaches the invention as claimed, including the lock management method according to claim 11, further comprising:

increasing, when said bit that represents said locked state is set, the number of queues of threads that can access said specific object and storing the updated number, and determining whether said bit that represents said lock on said specific object represents said locked state (col. 9 lines 37-46); and

reducing, when said bit that represents said locked state is not set, the number of said queues of said threads that access said specific object and storing the updated number, and terminating a locking process without any other process being performed (col. 10 lines 5-14).

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23. As per claim 13, Clark teaches the invention as claimed, including the lock management method according to claim 12, further comprising:

permitting said second thread, when said bit that represents said locked state is set and when an identifier that is not related to the representation of said locked state or said unlocked state is stored in said storage area, to remain in a busy waiting state until a thread that maintains said lock on said object is no longer present and said bit that represents said locked state is changed to represent said unlocked state (col. 10 lines 5-42).

24. As per claims 14-15, IBM teaches the invention as claimed, including an apparatus comprising means for implementing the method of claims 9-10, respectively (pg. 287, paragraph 1).

25. As per claims 16-18, IBM teaches the invention as claimed, including an apparatus comprising means for implementing the method of claims 11-13, respectively (pg. 287, paragraph 1).

### ***Conclusion***

26. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

He (USPN 6,105,048) teaches a contention unit that enables multitasking through use of a semaphore.

Heeb et al. (USPN 5,918,033) teaches multiple processes competing for access to a shared resource, wherein the access is regulated by a scoreboarding method.

Lyles (USPN 5,689,508) teaches using contention bits and a queuing mechanism to control access to a shared resource.

Hara et al. (USPN 5,175,861) teaches a competition-judging circuit that grants access to a lock.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Syed J Ali whose telephone number is (703) 305-8106. The examiner can normally be reached on Mon-Fri 8-5:30, 2nd Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai T An can be reached on (703) 305-9678. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Syed Ali  
May 11, 2004



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